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[SUBCOMMITTEE PRINT]

THE PRODUCTIVITY FACTOR IN FEDERAL POWER COMMISSION OPINION NO. 770

STAFF STUDY

BY THE

SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS

OF THE

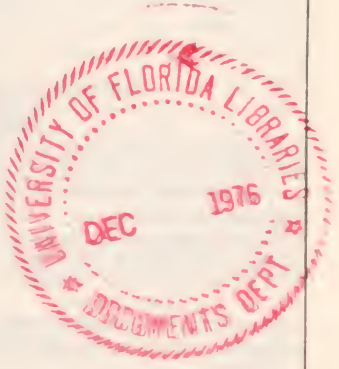
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE

HOUSE OF REPRESENTATIVES

NINETY-FOURTH CONGRESS

SECOND SESSION

OCTOBER 1976



This report has not been approved or disapproved by the Subcommittee Members

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U.S. GOVERNMENT PRINTING OFFICE

78-589 WASHINGTON : 1976

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LETTER OF TRANSMITTAL

CONGRESS OF THE UNITED STATES,
HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS,
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D.C., October 27, 1976.

DEAR SUBCOMMITTEE MEMBER: Enclosed for your consideration is a copy of a Subcommittee staff study entitled "The Productivity Factor in FPC Opinion 770." Productivity is the term used to measure (in thousands of cubic feet) the amount of natural gas found per successful foot drilled. As such it is the key elements in setting the price of new natural gas. Following the issuance of FPC Opinion 770 which raised the price of new natural gas from 52 cents to $1.42 per thousand cubic feet (Mcf), I instructed the staff to review Form 64 and Form 40 reports on file at the FPC. The two forms contain productivity data, submitted under oath by natural gas producers. On the basis of this data, the staff established a productivity index for the years 1965–1974 independent of the published industry data relied upon by the Commission in Opinion 770. The report acknowledges that the Form 64 and 40 data had not been audited or verified. But whatever the infirmities of unaudited data, the presumption of correctness is higher for submissions under oath than the American Gas Association reserve data employed by the Commission in Opinion 770.

The resulting productivity factor is much higher than that employed by the Commission and calls for a new gas price of $1.00 per Mcf, including a Federal income tax allowance. If the tax allowance is omitted, as it should be, the data require a new gas price of 84 cents per Mcf. The study points, moreover, to a major flaw in the FPC's handling of reserve revisions. An alternative approach employed by the staff requires a new gas price of from 46 to 55 cents per Mcf. Those prices are reasonably close to the prices recommended by the FPC's own Office of Economics and Producer Rates Division.

The staff study does not recommend a specific price for new natural gas. It does, however, demonstrate that the Commission's $1.42 price is excessive and that it ignores countervailing evidence in the possession of the Commission.

Moreover, if the staff's theory of reserve revisions is correct, the data suggest that the price of new natural gas should be rolled back to its pre-July level of 52 cents per Mcf. In any event, the Commission for several months now has been sitting on evidence, which if properly used, would have permitted it to end its reliance on controversial industry published data. The failure of the Commission to consider this evidence prior to its final reconsideration of Opinion 770, raises serious questions about the willingness of the FPC Commissioners to discharge their duties under the Natural Gas Act.

Sincerely,

JOHN E. MOSS,
Chairman, Subcommittee on Oversight and Investigations.

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Summary

In the largest rate increase ever granted by a U.S. regulatory agency, the Federal Power Commission in Opinion 770, issued July 27, 1976, raised the price of new natural gas sold in interstate commerce from 52 cents to $1.42 per thousand cubic feet (Mcf). The Commission estimated the first year consumer cost of this increase to be $1.5 billion, based on an October 21 clarifying order that purports to eliminate some of the more egregious loopholes in the Commission's definition of "new" natural gas previously pointed out by the Subcommittee.

The Commission cited as a "cornerstone" of its dramatic increase in the price of natural gas, declining productivity. Productivity is the term used to measure the amount of gas found per successful foot drilled in any given year. As such, it is the single most important element in natural gas ratemaking. Under the Natural Gas Act the Commission is required to set rates on the basis of actual costs. The use of an artificially low productivity factor, therefore, will yield a higher, non-cost based price, in violation of the Act.

In Opinion 770 the Commission arrived at a productivity factor of 300, using published data from the American Gas Association and other industry sources. Later, the Subcommittee obtained from the Commission previously unused Form 64 and Form 40 data which had been submitted to the Commission, under oath, by various natural gas producers, and which permitted the Subcommittee staff to determine a productivity factor independently of industry published data.

This new data, when incorporated into the productivity formula employed by the Commission in Opinion 770, yields a productivity factor of 411 and resultant new gas price of $1.00 per Mcf. But under the Subcommittee staff's productivity formula, this same data results in a productivity factor of at least 680 and a new gas price of 55 cents per Mcf.* Elimination of the Commission's controversial Federal income tax allowance yields even lower prices—84 cents per Mcf under the Commission's productivity formula, and 46 cents per Mcf under the staff's alternative methodology.

* Staff's recommended formula omits both positive and negative revisions of reserves discovered in earlier years based on the conclusion that such revisions are not relevant to current productivity levels.

THE PRODUCTIVITY FACTOR IN FEDERAL POWER COMMISSION OPINION NO. 770

Introduction

The Federal Power Commission in Opinion No. 770, issued July 27, 1976, raised the price of natural gas from wells commenced on or after January 1, 1975, to a base price of $1.42 per thousand cubic feet (Mcf) with a one cent per quarter escalator. The $1.42 price represents a 184 percent increase over the previous price of 50 cents per Mcf, with a cent-per-year escalator, the Commission had found to be "just and reasonable" in December 1974.[1] The July price increase, as "clarified" by the Commission on October 21, will add an estimated $1.5 billion to consumer gas bills in the next twelve months.[2]

The Commission, Don S. Smith dissenting, sought to justify its price increase on the basis of three factors—decreased productivity, increased drilling costs, and the first-time use of a Federal income tax allowance, ostensibly to compensate producers for virtual repeal of the depletion allowance on natural gas.[3] Forty-three cents of the new gas price is attributed to the tax allowance. The Subcommittee staff, in an August 27 report, questioned the lawfulness of the tax allowance, because of the Commission's refusal to consider the industry's foreign tax credits, and other so-called "non-jurisdictional" tax benefits, and its failure to obtain actual producer tax data.[4]

But aside from the tax allowance, new productivity data in the Commission's possession establishes that the $1.42 rate is based on an even greater error. From a review of that data the Subcommittee staff has determined that new gas can be cost justified at a price not in excess of $1.00 per Mcf, even assuming, for the sake of argument, the reasonableness of the Commission's productivity formula. And if the tax factor is disallowed, as it should be, the data requires a price of 84 cents per Mcf.

But the Subcommittee staff's criticism goes beyond the Commission's failure to price new gas on the basis of newly available evidence. It extends to the basic methodology used by the Commission to determine productivity. An alternative method, developed by the Subcommittee staff (see Part II, infra), yields a new gas price of only 55 cents per Mcf with a Federal income tax allowance, 46 cents without it.

PART I

Productivity

The Commission recited in 770 that productivity "is the cornerstone of the analysis used to determine the cost of 'new' gas." [5] It is the measure of the amount of gas found per successful foot drilled, and as such:

> Productivity in terms of Mcf per foot drilled has the most significant impact upon the whole of the rate structure. "Productivity determines the allowance for

[1] FPC Opinion No. 699-H issued December 4, 1974.
[2] FPC Order Requiring New Producer Filings, Docket RM 75-14, October 21, 1976.
[3] Opinion No. 770, p. 4.
[4] Staff testimony of Dr. John R. Galloway and Dr. Oscar Strongin before the Subcommittee on Oversight and Investigations of the House Committee on Interstate and Foreign Commerce, August 27, 1976.
[5] Opinion No. 770, p. 33.

successful well costs, which in turn affects the allowance for lease acquisition costs and the allowance for production facilities; productivity also determines the allowance for dry hole costs, which affects the allowance for exploration overhead expenses; and so on, virtually *ad infinitum*." [6]

The first-time inclusion of a Federal income tax allowance by the Commission further enhances the importance of productivity, since now productivity influences both the return element of the rate, and to an almost equal extent, the amount of the Federal income tax allowance itself. Yet ironically, as noted by Commissioner Smith in his 770 dissent, productivity "is a factor that must be developed from the least reliable data series to which must be applied the greatest amount of judgment." [7]

Productivity, in Opinion 770, was determined by dividing non-associated gas reserve additions (including revisions of previous estimates) for a selected number of years by the total successful gas footage for the same years. In this case the Commission arrived at a figure of 300 Mcf per succesful foot drilled, representing the average between results of two data series: 1967–1975 and 1968–1975.[8] The selection of those two data series, nine and eight years, would be troublesome enough without the highly suspicious nature of the data itself, which came in this case, as it always has in the past, from industry publications.

Gas reserve additions are those published by the American Gas Association (AGA), an industry trade group, and the successful gas footage figure is derived from a variety of industry publications. AGA reserve data, the most important element in determining productivity, has become increasingly suspect of late. Last January, for example, the Subcommittee staff demonstrated that AGA reserve estimates for a major portion of the Federal Outer Continental Shelf were 37.4 percent lower than those provided by the U.S. Geological Survey.[9] Neither the AGA reserve data nor the industry published successful gas footage data have ever been subjected to a full FPC audit or review.

Even a small variation in the ultimate productivity figure can amount to millions of consumer dollars. In his dissent to Opinion 770, Commissioner Smith came up with a factor of 354, instead of the majority's 300, which by his calculations would yield a price of $1.19 per Mcf, about 25 cents less than that ordered by the majority.[10] That difference amounts to $360 million in direct costs to consumers for the first year alone, according to Commissioner Smith. The higher the productivity factor, of course, the lower the price of gas.

This is not to say that the FPC has not recognized the infirmities of relying on AGA and other industry published data. Its stated concern over that very problem led to the issuance of two orders promulgating Forms 40 and 64, requiring natural gas producers to furnish the FPC with the key data components of productivity: reserve additions and successful drilling footage.[11] Both forms required

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[6] FPC Order 526, February, 1975, p. 7, quoting Commissioner Moody, dissenting in Opinion No. 699.
[7] Dissenting Opinion of Commissioner Don S. Smith, FPC Opinion No. 770, p. 2.
[8] Opinion No. 770, p. 41.
[9] Staff testimony of Dr. John R. Galloway before the Subcommittee on Oversight and Investigations of the House Committee on Interstate and Foreign Commerce, January 21, 1976.
[10] Dissenting Opinion of Commissioner Don S. Smith, Opinion No. 770, p. 9.
[11] Form 64 also includes certain cost data including drilling costs, dry hole costs, and lease acquisition costs which are worthy of Commission and public review.

submissions under oath, subject to audit. Unfortunately, both wound up in the courts before Opinion 770 was rendered.

But many forms were submitted anyway; and these the Subcommittee staff was able to study in detail. The FPC, for its part, has not seen fit to use what Form 40 and 64 data is available, despite the magnitude of difference between the filed data and that published by the industry.

Form 40

On February 25, 1975, the Commission voted three-to-two to issue Order 526, establishing a comprehensive Form 40 reporting system designed to provide the Commission with reserve data useable in a number of areas, including ratemaking. As stated by the Commission in Order 526,

> There is no doubt that the proposed information will be of aid to the Commission in carrying out its obligation to assure "just and reasonable rates to the consumers of natural gas" for the Act was so framed as to afford consumers a complete, permanent and effective bond to protection from excessive rates and charges.[12]

Following the issuance of Order 526, the Commission established March 1, 1976, as the deadline for submission of 1974 Form 40 reserve data, and April 1, 1976, for 1975 reserve data. Future filings were to be received on or before the first of April of each reporting year.

Items 25–27 of Form 40 required each producer to report the volume of non-associated gas reserves for both the previous and the report year, as well as net changes during the report year.[13] Items 35–42 called for changes in the company's year-end reserve inventory, including positive and negative revisions of previous reserve estimates, extensions due to an increase in the proved area of a gas reservoir, new field discoveries, and new reservoirs discovered in old fields. Finally, Item 43 required each company to report net successful gas well footage producing non-associated reserve additions for the report year.

Together these items provide the information necessary to compute a company's productivity, both with and without the inclusion of revisions of previous reserve estimates.

Form 40 included the requirement that all information be furnished under oath by a company officer. Since the Natural Gas Act grants FPC the right "to inspect and examine all accounts, records, and memoranda of natural-gas companies," [14] it was understood that the Commission would systematically audit and verify the company's Form 40 submissions.

Form 64

On December 10, 1975, the Commission issued Order 543 promulgating Form 64, which required natural gas producers to furnish data on an annual basis regarding costs, exploration and development activities, and reserves. While Form 64 was addressed primarily to cost data, it did require reserve and drilling data (excluding Alaska

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[12] Order 526, p. 16, quoting *Atlantic Refining Co.* v. *Public Service Commission of New York*, 360 U.S. 378, at 388 (1959).

[13] The term non-associated natural gas refers to gas that is produced independently of any oil production. Associated gas is that which is produced in conjunction with the production of oil. Since associated gas production relates to the price of oil, associated gas which accounts for less than 20 percent of U.S. natural gas production, is not considered by the FPC in setting natural gas prices.

[14] Natural Gas Act of 1938, ch. 556 § 8, 52 Stat. 825; 15 U.S.C. § 717g(b).

and Hawaii) for the years 1965–1973. It omitted post–1973 reserve data to avoid duplicating the more detailed reservoir-by-reservoir data required by Form 40. As with Form 40, Form 64 required the submission of reserve data both with and without revisions of previous reserve estimates. Again, like Form 40, Form 64 data was to be submitted under oath by a company officer, subject to audit and verification by the FPC.

In the aggregate, therefore, Form 40 and Form 64 were designed to enable the Commission to determine productivity independently of AGA and other published industry data. According to a March 13, 1975, Commission Notice of Proposed Rulemaking, data from the two forms "will permit the Commission, in its biennial review of the nationwide rate, to rely primarily on information submitted directly to us and auditable by us, rather than to be forced to rely upon published data, not open to close scrutiny." This data the Commission further stated, "will be invaluable in providing the Commission with reliable data on productivity." [15] August 11, 1976, was set as the final date for the submission of Forms 64 for the period 1974–1975.

But the Commission's original plan to obtain a complete set of Form 64 and Form 40 data for use in computing productivity for the years 1964–1975 was frustrated by a series of legal challenges from natural gas producers.

Producer Opposition to Form 64

Superior Oil Company on April 26, 1976, and Mitchell Energy Corporation on May 7, 1976, petitioned the U.S. Court of Appeals for the Fifth Circuit to review Orders 543 and 543–A which established Form 64. The companies described the Orders as arbitrary and capricious, duplicitous, and overburdensome in that they required data not readily available to the producers. On July 29, 1976, nearly three months after the filing of the review petition, Mitchell applied to the Fifth Circuit for a temporary stay which was granted on August 4, pending further order of the Court. The Commission filed its response to the stay on August 16 where the matter now stands.

Producer Opposition to Form 40

Commission Orders 526 and 526–A, establishing Form 40, were also subjected to judicial review, in this instance before the Ninth Circuit Court of Appeals, which on June 2, 1976, ruled in favor of the twenty-three gas producers who had filed the petition.[16] The Orders were set aside and returned to the Commission with instructions to develop a factual record to enable the Court to judge the FPC's need for Form 40 data, its availability from other Federal agencies, and the burden on gas producers charged with supplying it.

But the gravamen of the producers' complaint, and of the Ninth Circuit's decision in their favor, turned largely on Form 40's curious insistence that reserve data be supplied on a reservoir-by-reservoir basis rather than ". . . on a field, lease interest, or any other commonly recorded and reported basis. . ." [17] The Court felt the Commission

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[15] Notice of Proposed Rulemaking, Docket RM75–24, March 13, 1975, p. 3.

[16] *Union Oil Co. of Calif., Getty Oil Co., Ashland Oil, Inc., Eason Oil Co., Gulf Oil Corp., Mobil Oil Corp. Texaco, Inc., Cabot Corp., Skelly Oil Co., General American Oil Co. of Texas, Burmah Oil & Gas Co., Tenneco Oil Co., Exxon Corp., Cities Service Oil Co., Phillips Petroleum Co., Mitchell Energy Corp., The Superior Oil Co., Sabine Royalty Corp., Continental Oil Co., Amoco Prod. Co.* v. *Federal Power Commission*, United States Court of Appeals for the Ninth Circuit, Docket Nos. 75-2891 et al., slip opinion, June 2, 1976.

[17] Id., p. 14.

had failed to fashion a factual evidentiary record demonstrating its "regulatory need for the data *in the form required.*" [18] Nor did the producers even "claim that the Commission has no regulatory need for reserve data; they only claim that the Commission does not need that data on a reservoir basis." [19]

This may account in some measure for Commissioner Smith's August 9, 1976, statement to a Senate Subcommittee, referring to problems with relying on industry generated data: "Part of our difficulty is our fault. I think some of the reasons the court enjoined our usage of Form 40 was because we could have done a better job designing it." [20]

Not withstanding the Ninth Circuit's decision, a good many companies did complete both Forms 40 and 64, which the Subcommittee staff was able to review.

Subcommittee Review of Form 40 and Form 64 Data

The Fifth Circuit's stay enabled producers to ignore the Commission's August deadline for submission of Form 64. Approximately 360 producers, however, notwithstanding the stay, submitted the forms in mid-August. Of these, 113 have been reviewed by the Commission staff and found to be complete and free of obvious error. The data has been computer processed and is almost instantly retrievable in a variety of useful forms. Included in these 113 Form 64's are submissions from nine of the 25 biggest natural gas producers in the country, including Amoco, Chevron, Champlin, Continental, Exxon, Getty, Gulf, Pennzoil, and Shell, plus submissions from nine of the next 25 leading producers, including Andarko, Bass, Diamond-Shamrock, Marathon, General-American Oil, Texas Gas, Columbia Gas, Cabot, and Monsanto. Together these 113 respondents are responsible for approximately 45 percent of total U.S. non-associated natural gas production, exclusive of Alaska.

In the case of the Form 40's, some 675 producers, although under no legal obligation to do so because of the rulings of the Ninth Circuit, submitted their 1974 Form 40's about January 1, 1976. By May 1, 1976, the FPC had received 1975 Form 40's from 225 producers.

Unlike the Form 64's, which had been reviewed by the FPC staff for completeness and reasonableness, the Form 40's were provided the Subcommittee staff in raw form. Out of the roughly 675 1974 Form 40 submissions, the Subcommittee staff considered those of 225 companies to be sufficiently complete to warrant analysis. These 225 include a representative number of both large and small producers, affording a statistically valid sample. Nine of the top 25 producers, for example, including Texaco, Exxon, Shell, Mobil, Continental, Sun, Gulf, Champlin, and Pennzoil, are included, along with nine of the next 25 leading producers, including Columbia Gas, Diamond-Shamrock, Andarko, Monsanto, Marathon, Armada-Hess, Bass, Texas Gas, and Texas Pacific. In the aggregate these Form 40 submissions cover about 47 percent of total U.S. non-associated production for 1974, excluding Alaska.

Year end 1975 Form 40's were submitted by 225 companies, but of these only 94 were judged by the Subcommittee staff to be complete

[18] Id., p. 12, emphasis supplied.
[19] Id., p. 13.
[20] Hearings, August 9. 1976, United States Senate, Committee on Commerce, Special Subcommittee on Oil and Natural Gas Production and Distribution, transcript p. 49.

and free of obvious error. The 94 submissions, in the view of the Subcommittee staff, do not constitute a statistically valid sample, because none of the top 25 producers is included. The 1975 Form 40 submissions, therefore, cannot be used to compute a meaningful productivity factor for that year.

After a detailed review, the Subcommittee staff is of the opinion that the Commission has before it a sufficient number of useable Form 64's and 40's to derive a statistically valid productivity series for the ten-year period 1965 to 1974. And certainly the data from the Forms is more trustworthy than that supplied in industry publications. This data can be used to arrive at a productivity factor both with and without revisions of previous reserve estimates.

The treatment of revisions of previous reserve estimates (both positive and negative) is particularly troublesome. The key factor in costing new gas is the amount of gas that the industry is *currently* finding per successful foot drilled. A 1975 productivity factor should not be raised or lowered, therefore, by including revisions of reserves originally reported in previous years.

AGA reported negative revisions have exceeded positive revisions in recent years. This might be due to the industry's suspected practice of having inflated 1950 and early 1960 reserve estimates to promote the use of natural gas and the construction of natural gas pipelines. Accordingly, the large net negative revisions that suddenly began to appear in 1969 can only relate to the original overreporting of reserves.[21]

From a purely random standpoint one would expect positive and negative revisions to be about equal. But from a geological perspective one would expect positive revisions to exceed the negative, as has been the case for 30 years with crude oil reserve estimates published by the American Petroleum Institute. And with respect to natural gas, there is even more reason to expect positive revisions to outstrip the negative because of the AGA's extremely conservative definition of proved reserves.

Proved reserves are defined as the "current estimated quantity of natural gas and natural gas liquids which analysis of geologic and engineering data demonstrate with reasonable certainty to be recoverable in the future from *known* oil and gas reservoirs under *existing* economic and operating conditions. Reservoirs are considered proved that have demonstrated the ability to produce *by either actual production or conclusive formation test.*" (Emphasis added). A definitive estimate of reserves originally in place cannot be obtained until a field has been depleted. Prior to that time, however, a reserve estimate under the AGA's conservative definition is like the first row of goods on a shelf, which are the only goods visable. Further drilling and production are more likely than not to increase the original reserve estimate beyond that which was originally determined, just as removal of a can from the grocer's shelf reveals yet another can just behind it.

The suddenness and magnitude of negative revisions reported by industry in recent years, strongly suggests that much of those

[21] As reported by the AGA, negative revisions of non-associated gas in 1969 exceeded positive revisions by 1.5 Tcf. For the three previous years positive revisions of non-associated reserves as reported by the AGA, exceeded negative revisions by from 3.5 to 4.8 Tcf.

negative revisions relate to previously discovered fields—something the Commission failed to take into account in Opinion 770.

To determine productivity, the Commission in Opinion 770 relied on AGA reported additions and revisions for an 8.5-year time span (1967/1968–1975). Indiscriminate use of AGA reported revisions during this period biased the Commission's resulting productivity factor downward to the extent that negative revisions of pre-1967 reserve additions were included.

The AGA and industry practice of reporting reserve revisions of previously discovered reserves has been documented by Dr. Joseph Lerner, who until recently was consulting energy economist for the Federal Trade Commission.[22] The 1969 AGA Bluebook, for example, estimated natural gas fields discovered in 1929 in Texas Railroad District I to have an ultimate recovery of 243.4 Bcf. In the following year the comparable figure, as reported by the AGA, was 151.9 Bcf, while two years later it was 41.5 Bcf. Thus the resulting nearly five-fold reduction in the reserves for these 1929 fields, which under the AGA and FPC's scheme of things, was permitted to influence the FPC's determination of how much new gas producers were finding per successful foot drilled in the early 1970's!

Clearly, a true productivity factor can be determined only after the careful assigning of revisions (both positive and negative) to the year of discovery, thus eliminating from consideration all revisions attributable to reserve additions reported prior to the period under review. But given the choice of determining productivity with and without revisions, the Commission opted for the former, apparently oblivious to the extent to which its resulting productivity factor was lowered by negative revisions properly belonging to an altogether different and irrelevant time period.

The Form 64 and Form 40 data on file with the Commission does not assign revisions to year of discovery either. Nonetheless, Subcommittee staff calculations derived from this data, and including all reported revisions, result in a 1965–1974 productivity factor of 411 (see Chart I), as opposed to the Commission's 1967/68–1975 factor of 300. That 411 figure, other factors being equal, translates to a new gas price of 100.4 cents per Mcf, including a Federal income tax allowance. Absent the tax allowance, the price falls to 84.4 cents per Mcf.

Significantly, as shown on Chart I, the 411 factor results even after consideration of a low 13.8 productivity factor in 1972, caused partly by Exxon's having reported net negative revisions that year of approximately 1 Tcf. At this writing there is no way for the staff to determine the extent to which these revisions relate to fields discovered prior to 1965. By totally eliminating Exxon, however, the staff has calculated that the productivity factor, including revisions for the years 1965 to 1974, averages about 476.

One can anticipate, however, the Commission's maintaining that its 8.5 year 1967–1975 and 1968–1975 series as used in Opinion 770 is a

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[22] Dr. Joseph Lerner, Unpublished study, "Estimates of Ultimate Recovery of Non-Associated Natural Gas, Texas Railroad Commission Districts and Louisiana." Other examples include the following:

(a) Fields discovered in 1935 in Texas Railroad Commission District 3 were estimated in 1970 to have an ultimate recovery of 5,809.5 Bcf while in 1973, the estimate was 3,828.3 Bcf, a downward revision of almost 2.0 Tcf.

(b) Fields discovered in South Louisiana in 1937 were estimated in 1969 to have an ultimate recovery of 2,939.3 Bcf while in 1972, it was 2,020.1 Bcf and in 1975 1,925.3 Bcf for a total downward revision of more than 1.0 Tcf.

better measure of productivity than the staff's 10-year 1965–1974 series. The Commission defended its use of an eight and nine year time span in Opinion 770 on grounds that this was a sufficiently long enough period of time to compensate for AGA "reporting lags, lack of information required to make a reserve estimate in any given year, and inaccuracies found in the AGA reports . . ." This same time series, moreover, was said to be short enough to allow for the most recent declines in productivity as determined on the basis of AGA data.[23]

Whereas ideally 1975 productivity data should be utilized in pricing new gas, the sparse sample size obtained from a review of 1975 Form 40 productivity data makes this an impossibility. A ten-year series as used by the staff is the same as was used by the Commission in the two rate decisions (699 and 699–H) that preceded Opinion 770. Even assuming, however, that no consideration should be given to the years 1965 and 1966, at best an arbitrary assumption, the resulting eight year 1967–1974 productivity factor, as described by the staff on the basis of Form 64 and 40 data, is 320. Use of this shortened time series, however, highlights the fallacy of the Commission's blind embrace of reserve revisions, especially Exxon's 1972 1 Tcf net negative revision. Omitting Exxon from this data series results in a 1967–1974 productivity factor with revisions of 414, again considerably higher than the Commission's 300.

PART II

As noted in Part I, the productivity factor employed by the Commission in Opinion 770 is understated because of two factors: the Commission's refusal to utilize Form 40 and 64 data and by its indiscriminate use of reserve revisions. To obtain a true productivity factor it is necessary to attribute all reported revisions to the year of discovery. Failing that, the next best approach is to exclude all revisions from consideration, in view of the huge negative revisions that have been reported in recent years and on the theory that positive revisions, if properly accounted for, would exceed negative revisions.

Accordingly, with the Form 64's and 40's as a base, the staff constructed a 1965–1974 productivity factor exclusive of all revisions. As shown on Chart I, the resulting calculations yield a productivity factor of 680 which results in a new gas price of 55 cents per Mcf with a Federal income tax allowance and 46 cents per Mcf without it. This pre-tax price of 46 cents per Mcf comes considerably closer to the 58-cent and 62-cent per Mcf pre-tax prices recommended by the FPC's own Office of Economics and Producer Rates Division than does the roughly $1.00 per Mcf pre-tax price adopted by the Commission in Opinion 770.

A new gas price of 46 cents per Mcf, calculated by the staff, may be surprising to those conditioned to accept the industry's OPEC influenced demands. Yet it is worth noting that this price is 20 cents per Mcf, or 77 percent, higher than the price set by the Commission only five years ago on the basis of a pledge from natural gas producers that a price of 26 cents per Mcf would—

[23] Opinion No. 770, p. 41.

make funds available to the producing industry and create a regulatory atmosphere which should provide an incentive for a substantial increase in exploratory and developmental activities and make a major contribution to bringing forth additional supplies of gas.[24]

Subcommittee Staff Conclusions

The Commission in reviewing its July, 1976, new gas price of $1.42 per Mcf was in the position of being able to eliminate much of the guesswork from natural gas ratemaking by looking to data other than that which had been published by the AGA. A few months of additional work, with literally billions of dollars at stake, would have enabled the Commission to determine a reasoned productivity factor. Indeed, it would not even have been necessary for the Commission to review all Form 64 and 40 data in its possession. Under the circumstances it would have been appropriate for the Commission to select a scientific sample of Form 64 and 40 submissions. These submissions could then have been audited and verified, and the revisions assigned to the appropriate years of discovery.

The FPC should revise Opinion 770 and utilize actual productivity data which it now has in its possession rather than continuing to rely on unaudited industry data which is not under oath. In the interim, the Subcommittee staff concludes that the Commission's $1.42 per Mcf price is at variance with evidence in the hands of the Commission and is therefore unreasonable and unlawful.

[24] Opinion No. 598, Appendix A, p. 27 (July 16, 1971).

CHART I

NATURAL GAS PRODUCTIVITY, 1965-75 [1]

Year	Successful gas well footage (feet)	Reserve extensions and new field and reservoir discoveries (million cubic feet)	Productivity (thousand cubic feet per foot)	Reserve revisions (plus and minus) extensions and new field and reservoir discoveries (million cubic feet)	Productivity (thousand cubic feet per foot)
Form 64:					
1965 [2]	7,989,914	8,397,102	1,051.0	6,947,179	869.5
1966	8,561,887	7,604,350	888.2	5,911,714	690.5
1967	7,019,146	5,369,191	803.4	4,956,829	760.2
1968	6,505,231	5,925,691	910.9	2,890,051	444.3
1969	6,376,771	3,664,095	574.6	1,551,444	243.3
1970	5,740,284	3,744,460	652.3	2,140,459	372.9
1971	5,851,633	3,745,866	640.1	841,054	143.7
1972	7,296,998	3,105,730	425.6	100,679	13.8
1973	8,432,879	3,616,993	428.9	1,732,986	205.
Total	63,774,661	45,443,298		27,072,396	
Form 40:					
1974 [3]	10,390,270	4,428,954	426.2	4,486,762	431.2
1975 [4]	3,937,807	1,049,566	266.5	963,313	244.6
Productivity, 1965–73 (reserves divided by footage)			712.6		424.5
Average productivity [5]			708.3		410.0
Productivity, 1965–74 (reserves divided by footage)			672.4		425.5
Average productivity [5]			680.1		411.4

[1] Data from FPC form 64 for 1965–73 and form 40 for 1974.
[2] 1965–73 period includes data from 113 companies that produced about 7.7 Tcf of natural gas in 1974.
[3] 1974 data from 225 companies that produced about 8 Tcf of natural gas in 1974.
[4] 1975 data from 94 companies do not include any of the top 25 producers; data are not considered sufficiently complete for inclusion in productivity calculations.
[5] Average productivity is the sum of the productivity of each year divided by the number of years.

Appendix

Congress of the United States,
Committee on Interstate and Foreign Commerce,
Washington, D.C., November 24, 1976.

Hon. Richard L. Dunham,
Chairman, Federal Power Commission,
Washington, D.C.

Dear Mr. Chairman: In published newspaper reports and in Opinion 770–A issued November 5, 1976 certain allegations were made concerning the Subcommittee's October 31, 1976 staff study "The Productivity Factor in FPC Opinion 770." Specifically your assistant, Danny J. Boggs and the Commission dismissed the Subcommittee staff report on the following grounds:

(1) The Form 64 and 40 productivity data on file at the Commission is not of sufficient quality for use in ratemaking. Mr. Boggs, according to the *Washington Star*, went so far as to describe the data as "crummy."

(2) The Form 64 and 40 data on file at the Commission tends to support the 300 productivity factor employed by the Commission in Opinion 770 (Opinion 770–A, p. 43).

(3) Drilling, dry hole, and lease acquisition data as represented in Form 64 could justify a price higher than $1.42 per thousand cubic feet (Mcf).

The facts, however are these:

(1) Form 64 and 40 productivity data when reviewed for obvious filing errors and having been attested to by high corporate officials carries a much higher presumption of validity than unverified and unattested American Gas Association data. Even assuming the data to be "crummy," there was no reason for the Commission not to have upgraded the quality of the data by audit and verification.

(2) Form 40 and 64 data available to the Commission do not support the 300 productivity factor and the $1.42 per Mcf price adopted by the Commission in Opinion 770. In Opinion 770–A the Commission obtained this result by constructing a 1967–1975 Form 64- and 40-based productivity factor as opposed to the 1965–1974 series employed by the Subcommittee staff. The staff did not calculate a 1975 productivity factor because of the severely limited number of 1975 Form 40's on file at the Commission. The Commission in constructing its 1975 Form 40-based productivity factor arbitrarily assigned a weight of three to compensate for the small number of 1975 Form 40 filings. One cannot, however, transform a statistically invalid sample into a worthwhile measure by multiplying a small, unrepresentative sample by some arbitrary number. The ten year 1965–1974 productivity series employed by the Subcommittee staff is the only series that can be obtained on the basis of a full and judicious use of Form 64 and 40 data. Use of a ten year productivity series conforms, moreover, to the methodology used in Opinion 699 and 699–H that immediately preceded Opinion 770 and 770–A. A ten year series was said in Opinion 699 to be "of sufficient length to ensure that a reporting lag or the lack of the information required to make a reserve estimate in any given year will not unduly influence the end result while at the same time giving the requisite consideration to the more recent industry experience in finding new supplies of non-associated and associated gas."

(3) Form 64 drilling, dry hole and lease acquisition costs, unlike the productivity data has not been reviewed by the FPC staff for gross data entry errors and out of range situations. Form 64 drilling cost data is suspect, moreover, since:

(*a*) It does not appear probable that average dry hole costs should exceed successful well costs as was reported for 1974 since successful well costs invariably exceed dry hole costs.

(*b*) The reported near 40 percent increase in successful well costs for 1975 over 1974 does not appear reasonable.

(*c*) The more than 60 percent increase in dry hole costs from 1973 to 1974 and a further 20 percent increase from 1974 to 1975 (or a two-year increase of 88 percent) do not seem reasonable.

The staff study further stressed that a true productivity value can be determined only after assigning revisions to the year of discovery and that the Commission's failure to consider this factor resulted in a significant understatement of productivity. The Commission addressed this issue in Opinion 770–A (pp 49–51) in a "model" of logic, that both I and the staff confess to having read many times and still do not comprehend. According to the Commission:

> Exclusion of revisions can only tend to distort the productivity calculations. If there was a tendency to bias initial reserve estimates too low, then failure to include reserves [sic] would clearly lead to underestimation of productivity. If there was a tendency to bias reserve estimates high, then exclusion of revisions would lead to clear over-estimation of productivity. If there is no bias, and the initial estimates are neither high nor low on the average, then inclusion of revisions should have no appreciable effect over a long period of time. Thus, if an initial estimation bias were to exist, inclusion of revisions would be proper, and if no bias were to exist, inclusion would also be proper. Therefore, revisions inclusion is proper even without proof of bias.

This "heads you win—tails I lose" rationale in denying the existence of this flaw in the FPC's productivity methodology is symptomatic of other Commission actions that have cavalierly negated the intent and spirit of the Natural Gas Act.

As previously indicated, there is more than a 65% difference in productivity (from Form 40/64 data) when calculated with revisions and without revisions. Therefore, even assuming the validity of the reported drilling cost increases, the impact is more than offset by using the productivity value without revisions. On this basis, it can be calculated that the price would be under $1.00 per Mcf including a Federal income tax allowance.

Sincerely,

JOHN E. MOSS,
Chairman, Subcommittee on Oversight and Investigations.

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